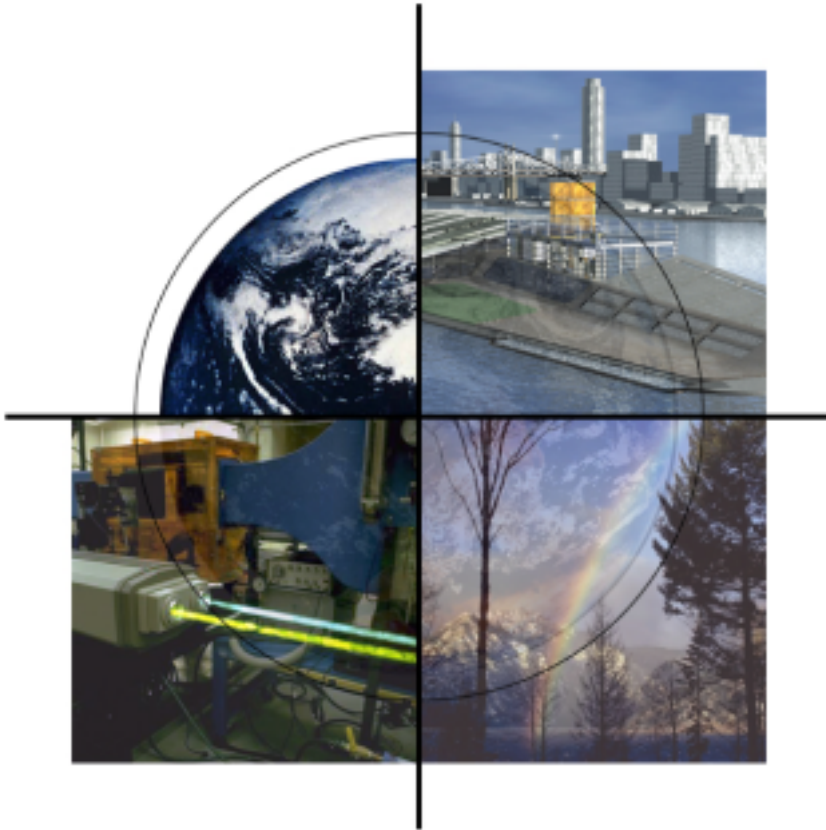


# ***FutureGen***

## **Power, Hydrogen & Sequestration Research Plant**

**U.S. DOE and CURC  
Coal Program Workshop**

**Pittsburgh, PA  
April 6-7, 2004**



**Mike Eastman, Technology Manager  
National Energy Technology Laboratory**



# Presidential Initiatives

**February 27, 2003**

***FutureGen Initiative*** --“...the United States will sponsor a \$1 billion, 10-year demonstration project to create the world's first coal-based, zero-emissions electricity and hydrogen power plant ...”

**January 28, 2003**

***Hydrogen Fuel Initiative*** – “Tonight I’m proposing \$1.2 billion in research funding so that America can lead the world in developing clean, hydrogen-powered automobiles.”

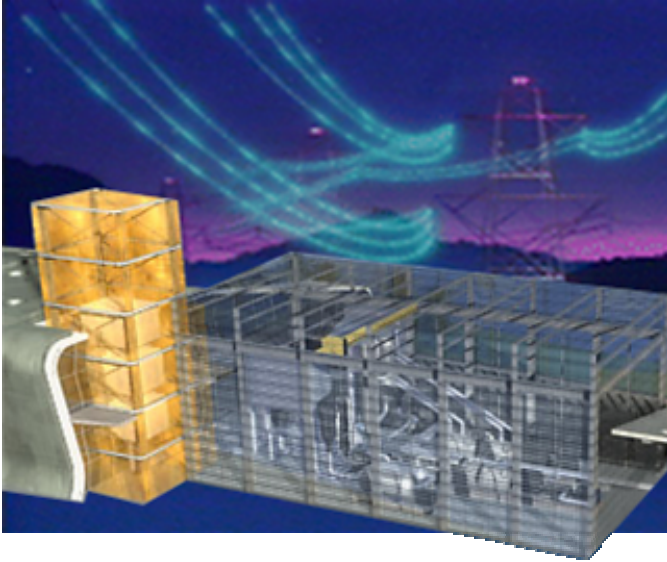
**February 14, 2002**

***Clear Skies Initiative*** -- calls for “... new tough standards to dramatically reduce the three most significant forms of pollution from power plants, sulfur dioxides, nitrogen oxides, and mercury.”

***Climate Change Initiative*** – “will set America on a path to slow the growth of our greenhouse gas emissions and, as science justifies, to stop and then reverse the growth of emissions.”



# Project Description



**World's first near-zero emission, coal-based power plant to:**

- ✓ *Pioneer advanced hydrogen production from coal*
- ✓ *Emit virtually no air pollutants*
- ✓ *Capture and permanently sequester carbon dioxide*
- ✓ *Integrate operations at full-scale – a key step to proving feasibility*

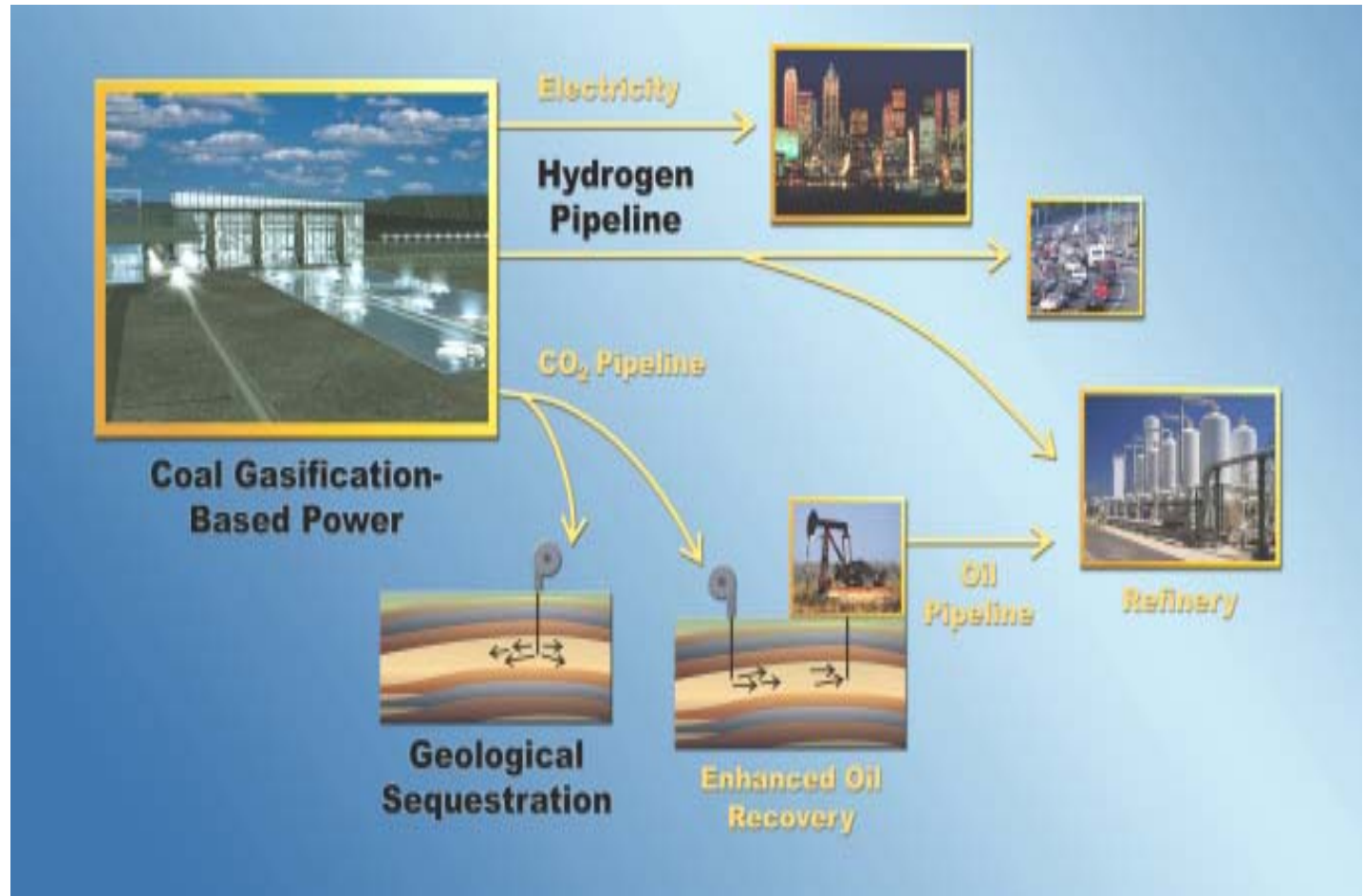
## Goals

- 1) **Operate a full-scale (275 MW) integrated research plant**
- 2) **Capture >90% of CO<sub>2</sub> and permanently sequester (1 million tons/year)**
- 3) **Prove effectiveness, safety and permanence of CO<sub>2</sub> sequestration**
- 4) **Test and validate cutting-edge technologies in “living laboratory”**
- 5) **Achieve Clean Coal Technology Roadmap 2020 near-zero emission targets**

# *FutureGen* – A “Zero-Emissions” Coal Plant

## **FutureGen:**

- ✓ *will test new technologies to capture CO<sub>2</sub> at power plant*
- ✓ *will test large-scale injection into oil fields or into deep geologic formations for permanent storage*



# R&D Activity – *FutureGen*

FY 2003 Enacted	FY 2004 Enacted	FY 2005 Flat	FY 2005 Request
\$0k	\$8,889k	\$8,889k	\$237,000k

- Key Programmatic Milestones – FY 2004

## ***Project Activity***

- ESAAB approval
- HQ Business Clearance contact
- Deliver *FutureGen* Program Plan to Congress
- Begin fact-finding and negotiation process with Consortium
- Award CA to Consortium
- Initiate preliminary design

## ***Schedule***

1Q/04  
2Q/04  
2Q/04  
2Q/04  
4Q/04  
4Q/04

## ***Status***

complete (with conditions)  
complete  
complete

## ***EIS Activity***

- Begin to ID environmental issues, & reg. & support contractor requirements
- Establish EIS Team
- Issue Advance Notice of Intent
- Issue formal Notice of Intent

1Q/04  
3Q/04  
3Q/04  
4Q/04

in progress  
in progress

# R&D Activity – *FutureGen*

FY 2003 Enacted	FY 2004 Enacted	FY 2005 Flat	FY 2005 President
\$0k	\$8,889k	\$8,889k	\$237,000k

- **Key Programmatic Milestones – FY 2005**

## ***Project Activity***

- Consortium identifies candidate sites
- Initiate site monitoring and characterization (candidate sites)

## ***Schedule***

**3Q05**

**3Q05**

## ***Status***

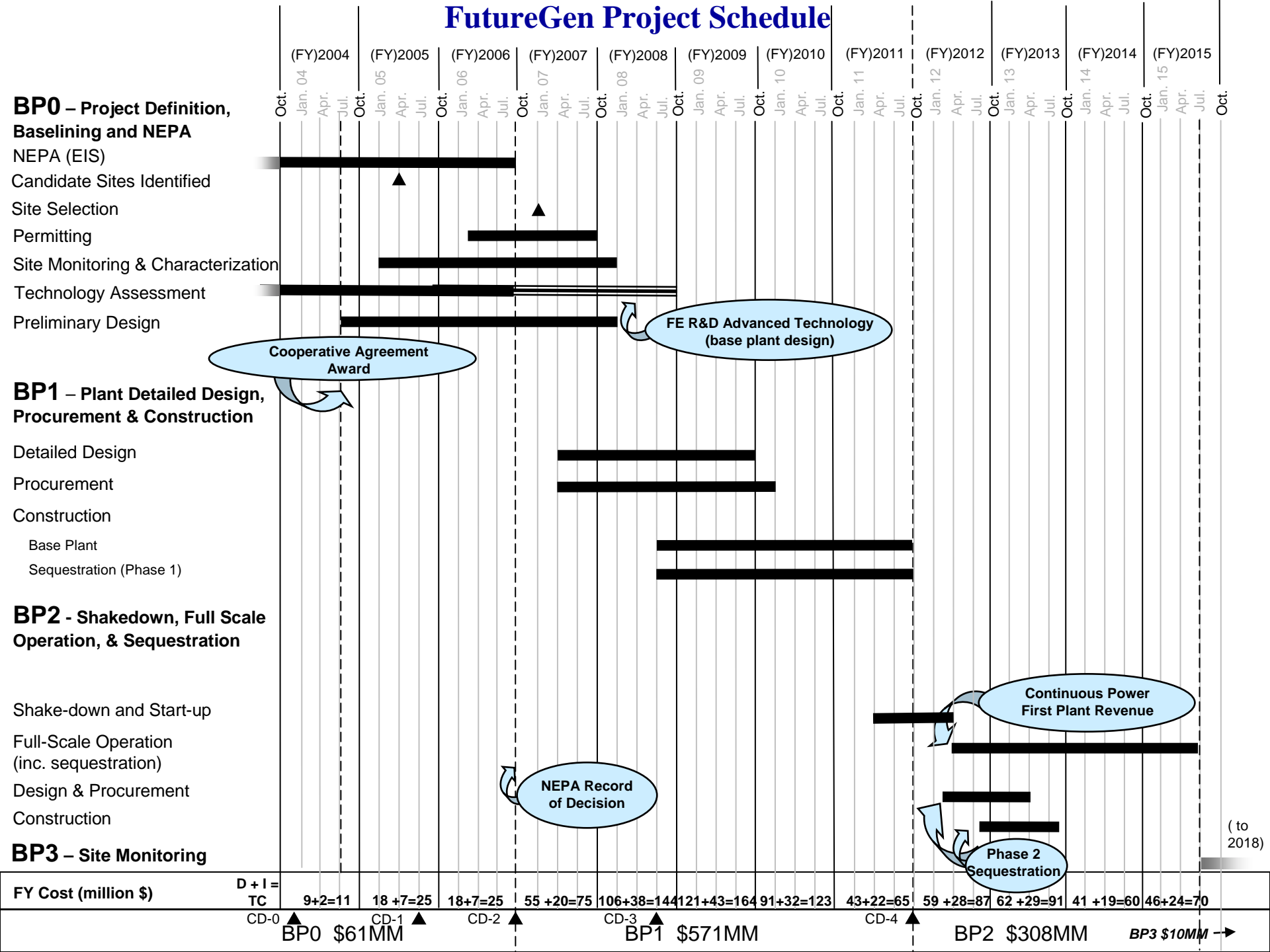
## ***EIS Activity***

- Complete public scoping meetings

**4Q05**

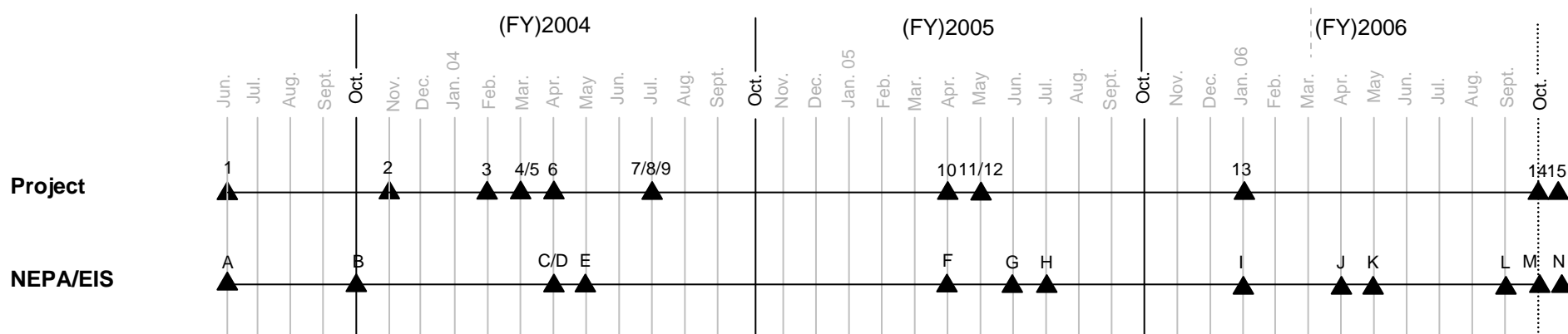


# FutureGen Project Schedule



# Project Milestone Schedule

## *Super-imposed w/NEPA Activities*



### MILESTONES:

- 1 – RFI closes for public comments
- 2 – Complete ESAAB CD-0 (conditional)
- 3 – Validate Non-competitive process and execute DNCFA
- 4 – Issue Program Plan to Congress
- 5 – Announce selection of Consortium
- 6 – Resolve CD-0 approval conditions
- 7 – Initiate preliminary design
- 8 – Complete negotiation/review of Cooperative Agreement
- 9 – Award Cooperative Agreement
- 10 – Identify candidate sites
- 11 – Deliver initial environmental information
- 12 – Initiate site monitoring and characterization
- 13 – Initiate permitting activities
- 14 – Complete Budget Period 0 – Initiate Detailed Design
- 15 – Preferred site selected

### NEPA ACTIVITIES:

- A – Initiate review of comments and environmental planning
- B – Initiate identification of environmental issues, regulatory requirements, and support requirements
- C – Decision to prepare EIS and initiate consultation
- D – Establish EIS team
- E – Issue Advance Notice of Intent
- F – Issue Notice of Intent to prepare an EIS
- G – Complete meetings for public scoping
- H – Close public comment period; initiate EIS preparation
- I – Issue Draft EIS
- J – Complete public hearings on the Draft EIS
- K – Close public comment period on the Draft EIS
- L – Issue Final EIS
- M – Issue Record of Decision
- N – Issue Mitigation Action Plan, if required



# FutureGen Project Funding & Cost Profile

FY	Appropriations	Expenditures					Key Activities
		<i>DOE Project</i>	<i>FE R&amp;D</i>	<i>Intern'l</i>	<i>Industry</i>	<i>Total</i>	
2004	\$9	\$9	- 0 -	- 0 -	\$2	\$11	NEPA; Technology Assessment; Preliminary Design
2005	237 (request)	18	- 0 -	- 0 -	7	25	Same as 2004 <i>plus</i> Candidate Sites Identified; Site Monitoring
2006	TBD	18	- 0 -	- 0 -	7	25	Complete NEPA; Start Permitting; Continue Monitoring and Preliminary Design
2007	TBD	50	- 0 -	5	20	75	Select Preferred Site; Continue Technology Assessment; Monitoring; Preliminary Design; Permitting
2008	TBD	100	- 0 -	6	38	144	Complete Permitting, Monitoring and Preliminary Design; Start Detailed Design and Procurement
2009	TBD	113	- 0 -	8	43	164	Complete Detailed Design; Start Construction
2010	TBD	81	- 0 -	10	32	123	Complete Procurement and Continue Construction
2011	TBD	13	20	10	22	65	Complete Construction; Start Shakedown and Sequestration
2012	TBD	29	20	10	28	87	Complete Shakedown; Start Full-scale Operation; Start Phase 2 Sequestration
2013	TBD	32	20	10	29	91	Full-scale Operation and Phase 2 Sequestration
2014	TBD	18	16	7	19	60	Introduce and Validate Advanced Technologies
2015	TBD	19	20	7	24	70	Introduce and Validate Advanced Technologies; Start Long-term Monitoring
2016 – 2018	TBD	- 0 -	- 0 -	7	3	10	Long-term Monitoring
<b>Total</b>	<b>\$676</b>	<b>\$500</b>	<b>\$96</b>	<b>\$80</b>	<b>\$274</b>	<b>\$950</b>	

# *FutureGen* Test Plan

- **Base plant technologies**
  - Oxygen production
  - Gasification
  - Gas separation & clean-up
  - Steam and combustion turbines
  - Alternate feedstocks (coal types)
- **Advanced cutting edge technologies** (*“living laboratory”*)
  - ITM oxygen production
  - Hydrogen production
  - Hydrogen combustion turbines
  - Fuel cells and hybrids
- **Sequestration system (Phase 1)**
- **Sequestration system (Phase 2)**
- **Long-term monitoring**

**NETL to Draft Test Plan outline and provide it to Consortium early in engagement activities**

# Key Issues

- ✓ **Funding availability**
  - ~\$9M in FY04 funding contingent upon delivery of Program Plan to Congress (+30 days) and Congressional briefings
- ✓ **Consortium organizational development awaiting outcome of DOE out-year funding commitment**
- ✓ **Cost sharing**
  - Consistent with EPACT R&D; Industry indicated willingness to invest only \$200M; no expectation of return on investment – “missionary work” for coal industry and public; net vs. gross DOE funding; current plan calls for additional cost-sharing
- ✓ **Sequestration introduces complexities**
  - Site selection, ES&H, NEPA, and public perception
- ✓ **Consortium pre-award engagement**
  - Identify key business issues and critical path project activities